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# TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/646,247
Filing Date	08/22/2003
First Named Inventor	S. S. P. Parkin
Group Art Unit	2811
Examiner Name	to be assigned

Total Number of Pages in This Submission

Attorney Docket Number **ARC920030071US1****ENCLOSURES (check all that apply)**

<input checked="" type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Assignment Papers (for an Application)	<input type="checkbox"/> After Allowance Communication to Group
<input type="checkbox"/> Fee Attached	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences
<input type="checkbox"/> Amendment / Reply	<input type="checkbox"/> Licensing-related Papers	<input type="checkbox"/> Appeal Communication to Group (Appeal Notice, Brief, Reply Brief)
<input type="checkbox"/> After Final	<input type="checkbox"/> Petition	<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> Affidavits/declaration(s)	<input type="checkbox"/> Petition to Convert to a Provisional Application	<input type="checkbox"/> Status Letter
<input type="checkbox"/> Extension of Time Request	<input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address	<input type="checkbox"/> Other Enclosure(s) (please identify below):
<input type="checkbox"/> Express Abandonment Request	<input type="checkbox"/> Terminal Disclaimer	
<input checked="" type="checkbox"/> Information Disclosure Statement	<input type="checkbox"/> Request for Refund	
<input type="checkbox"/> Certified Copy of Priority Document(s)	<input type="checkbox"/> CD, Number of CD(s) _____	
<input type="checkbox"/> Response to Missing Parts/ Incomplete Application		
<input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53		
	Remarks	

**SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT**

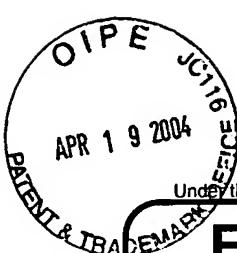
Firm or Individual name	Daniel E. Johnson
Signature	
Date	04/14/2004

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# FEE TRANSMITTAL for FY 2002

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT (\$ 0.00)

## Complete if Known

Application Number	10/646,247
Filing Date	08/22/2003
First Named Inventor	S. S. P. Parkin
Examiner Name	to be assigned
Group Art Unit	2811
Attorney Docket No.	ARC920030071US1

## METHOD OF PAYMENT

1.  The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit Account Number **09-0441**  
Deposit Account Name **IBM CORPORATION**

Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17

Applicant claims small entity status. See 37 CFR 1.27

2.  Payment Enclosed:

Check  Credit card  Money Order  Other

## FEE CALCULATION (continued)

## 3. ADDITIONAL FEES

Fee Code	Large Entity Fee (\$)	Small Entity Fee (\$)	Fee Code	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for ex parte reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	400	216	200	Extension for reply within second month	
117	920	217	460	Extension for reply within third month	
118	1,440	218	720	Extension for reply within fourth month	
128	1,960	228	980	Extension for reply within fifth month	
119	320	219	160	Notice of Appeal	
120	320	220	160	Filing a brief in support of an appeal	
121	280	221	140	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,280	241	640	Petition to revive - unintentional	
142	1,280	242	640	Utility issue fee (or reissue)	
143	460	243	230	Design issue fee	
144	620	244	310	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Processing fee under 37 CFR 1.17(q)	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	740	246	370	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	740	249	370	For each additional invention to be examined (37 CFR § 1:129(b))	
179	740	279	370	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	
Other fee (specify) _____					

SUBTOTAL (1) (\$ 0.00)

## 2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
	-20** =	<input type="text"/> x 18.00	= <input type="text"/>
Independent Claims	- 3** =	<input type="text"/> x 84.00	= <input type="text"/>
Multiple Dependent		<input type="text"/>	= <input type="text"/>

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description		
103	18	203	9	Claims in excess of 20
102	84	202	42	Independent claims in excess of 3
104	280	204	140	Multiple dependent claim, if not paid
109	84	209	42	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ 0.00)

\*\*or number previously paid, if greater; For Reissues, see above

\*Reduced by Basic Filing Fee Paid SUBTOTAL (3) (\$ 0.00)

## SUBMITTED BY

Name (Print/Type)	Daniel E. Johnson	Registration No. (Attorney/Agent)	37,033	Telephone	408-927-3367
Signature				Date	04/14/2004

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**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of : April 14, 2004  
S Parkin : Group Art Unit: 2811  
Serial No.: 10/646,247 : Examiner: Unknown  
Filed: August 22, 2003 : San Jose, California  
Title: MgO-based tunnel spin injectors

**INFORMATION DISCLOSURE STATEMENT**

Commissioner for Patents  
U.S. Patent and Trademark Office  
P. O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

Under the provisions of 37 CFR § 1.97 through §1.99 and pursuant to Applicant's duty of disclosure under 37 CFR §1.56, Applicant respectfully brings the following document(s) listed on the attached form PTO-1449 to the attention of the Examiner in charge of the above-identified application. Copies of the listed document(s) are provided herewith.

This Information Disclosure Statement is being submitted before receiving a first Office Action on the merits for the above-identified patent application. (No fee is due.)

This submission does not constitute an admission that the cited reference(s) are relevant or material to the claims. The reference(s) are only cited as constituting related art of which Applicant is aware.

It is respectfully requested that the listed references be considered by the Examiner and formally made of record in this application.

The Director is hereby authorized to charge payment of any deficiency in the above fee(s) or to charge any additional fees required under 37 CFR § 1.16 or 1.17 or credit any overpayment to Deposit Account No. 09-0441. A duplicate copy of this authorization is attached for the Finance Branch.

Respectfully submitted,

S. Parkin

By Daniel E. Johnson  
Daniel E. Johnson (#37033)  
Agent for Applicant  
Phone (408) 927-3367

DEJ:cgr

Attachments



APR 19 2004

PTO/SB/08A (10-01)

Approved for use through 10/31/2002. OMB 0651-0031

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**Substitute for form 1449A/PTO**

## **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**

*(use as many sheets as necessary)*

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***Complete if Known***

Application Number	10/646,247
Filing Date	August 22, 2003
First Named Inventor	S. Parkin
Art Unit	2811
Examiner Name	Unassigned
Attorney Docket Number	ARC920030071US1

U.S. PATENT DOCUMENTS					
Examiner Initials <sup>1</sup>	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
		US- 5,390,061	02-14-1995	Nakatani et al.	
		US- 5,465,185	11-07-1995	Heim et al.	
		US- 5,640,343	06-17-1997	Gallagher et al.	
		US- 5,650,958	07-22-1997	Gallagher et al.	
		US- 5,729,410	03-17-1998	Fontana Jr. et al.	
		US- 5,764,567	06-09-1998	Parkin	
		US- 5,841,692	11-24-1998	Gallagher et al.	
		US- 5,936,293	08-10-1999	Parkin	
		US- 6,153,320	11-28-2000	Parkin	
		US- 6,226,160	05-01-2001	Gallagher et al.	
		US- 6,347,049	02-12-2002	Childress et al.	
		US- 6,359,289	03-19-2002	Parkin	
		US- 6,388,268	05-14-2002	Kim et al.	
		US- 6,392,281	05-21-2002	Tsuge	
		US- 6,429,497	08-06-2002	Nickel	
		US- 6,535,365	03-18-2003	Lukaszew et al.	
		US- 2002/0076940 A1	06-20-2002	Hibino	
		US- 2002/0097534 A1	07-25-2002	Sun et al.	
		US- 2002/0097535 A1	07-25-2002	Ito et al.	
		US- 2002/0097537 A1	07-25-2002	Shimazawa	

Examiner Signature		Date Considered	
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**\*EXAMINER:** Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

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Substitute for form 1449A/PTO		<i>Complete if Known</i>	
<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>		Application Number	10/646,247
(use as many sheets as necessary)		Filing Date	August 22, 2003
		First Named Inventor	S. Parkin
		Art Unit	2811
		Examiner Name	Unassigned
Sheet	2	of	5
		Attorney Docket Number	
		ARC920030071US1	

## U.S. PATENT DOCUMENTS

## FOREIGN PATENT DOCUMENTS

Examiner Signature		Date Considered
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<sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

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**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

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Sheet

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of

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**Complete if Known**

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Filing Date	August 22, 2003
First Named Inventor	S. Parkin
Group Art Unit	2811
Examiner Name	Unassigned
Attorney Docket Number	ARC920030071US1

**OTHER PRIOR ART -- NON PATENT LITERATURE DOCUMENTS**

Examiner Initials	Cite No. 1	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>
		M. Julliere, "Tunneling Between Ferromagnetic Films", Physics Letters, Vol. 54A, Number 3, September 8, 1975, pp. 225-226.	
		R. Meservey et al., "Spin-Polarized Electron Tunneling", Physics Reports (Review Section of Physics Letters) Vol. 238, No. 4, 1994, pp. 173-243.	
		J. S. Moodera et al., "Large Magnetoresistance at Room Temperature in Ferromagnetic Thin Film Tunnel Junctions", Physical Review Letters, Vol. 74, No. 16, April 17, 1995, pp. 3273-3276.	
		T. Miyazaki et al., "Giant magnetic tunneling effect in Fe/A12O3/Fe junction", Journal of Magnetism and Magnetic Materials, Vol. 139, 1995, pp. L231-L234.	
		D. J. Keavney et al., "Perpendicular conductance and magnetic coupling in epitaxial Fe/MgO/Fe(100) trilayers", J. Appl. Phys., Vol. 81, No. 2, January 15, 1997, pp. 795-798.	
		P. K. Wong et al., "High conductance magnetoresistive tunnel junctions with multiply oxidized barrier", Journal of Applied Physics, Vol. 83, No. 11, June 1, 1998, pp. 6697-6699.	
		E. Y. Tsymbal et al., "Spin-polarized electron tunneling across a disordered insulator", Physical Review B, Vol. 58, No. 1, July 1, 1998-I, pp. 432-437.	
		S.S.P. Parkin et al., "Exchange-biased magnetic tunnel junctions and application to nonvolatile magnetic random access memory (invited)", J. of Applied Physics, Vol. 85, No. 8, April 15, 1999, pp. 5828-5833.	
		K. Aoshima et al., "Thermal deterioration mechanism of CoFeB/PdPtMn Spin valves", J. of Applied Physics, Vol. 85, No. 8, April 15, 1999, pp. 5042-5044.	
		Ph. Mavropoulos et al., "Complex Band Structure and Tunneling through Ferromagnet/Insulator/Ferromagnet Junctions", Phys. Review Letters, Vol. 85, No. 5, July 31, 2000, pp. 1088-1091.	
		D. J. Monsma et al., "Spin polarization of tunneling current from ferromagnet/A12O3 Interfaces using copper-doped aluminum superconducting films", Applied Physics Letters, Vol. 77, No. 5, July 31, 2000, pp. 720-722.	

Examiner  
SignatureDate  
Considered

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**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

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Sheet

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of

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**Complete if Known**

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Filing Date	August 22, 2003
First Named Inventor	S. Parkin
Group Art Unit	2811
Examiner Name	Unassigned
Attorney Docket Number	ARC920030071US1

**OTHER PRIOR ART -- NON PATENT LITERATURE DOCUMENTS**

Examiner Initials*	Cite No. 1	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>
		X.-F. Han et al., "Fabrication of high-magnetoresistance tunnel junctions using Co75Fe25 ferromagnetic electrodes", Applied Physics Letters, Vol. 77, No. 2, July 10, 2000, pp 283-285.	
		H. Xi, "Annealing Effect on Exchange Bias in Ni81Fe19/Cr50Mn50 Bilayers", IEEE Transactions on Magnetics, Vol. 36, No. 5, September 2000, pp. 2644-2646.	
		S. Cardoso et al., "High thermal stability tunnel junctions", Journal of Applied Physics, Vol. 87, No. 9, May 1, 2000, pp. 6058-6060.	
		S. Cardoso et al., "Spin-tunnel-junction thermal stability and interface interdiffusion above 300 C", Applied Physics Letters, Vol. 76, No. 5, January 31, 2000, pp. 610-612.	
		M. Takiguchi et al., "Thermal degradation of spin valve multilayers caused by Mn Migration", Journal of Applied Physics, Vol. 87, No. 5, March 1, 2000, pp. 2469-2471.	
		H.L. Meyerheim et al., "Geometrical and Compositional Structure at Metal-Oxide Interfaces: MgO on Fe(001)", Physical Review Letters, Vol. 87, No. 7, August 13, 2001, pp. 076102-1 through 076102-4.	
		M. Bowen et al., "Large magnetoresistance in Fe/MgO/FeCo(001) epitaxial tunnel junctions on GaAs(001)", Applied Physics Letters, Vol. 79, No. 11, Sept. 10, 2001, pp. 1655-1657.	
		W. Wulfhekel et al., "Single-crystal magnetotunnel junctions", Applied Physics Letters, Vol. 78, No. 4, Jan. 22, 2001, pp. 509-511.	
		W. H. Butler et al., "Spin-dependent tunneling conductance of Fe/MgO/Fe sandwiches", Physical Review B, Vol. 63, Jan. 8, 2001, pp. 054416-1 through 054416-12.	
		Y. Kim et al., "Magnetoresistance and interlayer diffusion in PtMn spin valves upon postdeposition annealing", J. of Applied Physics, Vol. 89, No. 11, June 1, 2001, pp. 6907-6909.	
		S. Yuasa et al., "Spin-Polarized Resonant Tunneling in Magnetic Tunnel Junctions", Science, Vol. 297, July 12, 2002, pp. 234-237.	

Examiner  
SignatureDate  
Considered

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**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

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Sheet 5 of 5

**Complete if Known**

Application Number	10/646247
Filing Date	August 22, 2003
First Named Inventor	S. Parkin
Group Art Unit	2811
Examiner Name	Unassigned
Attorney Docket Number	ARC920030071US1

**OTHER PRIOR ART -- NON PATENT LITERATURE DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>
		E. Popova et al., "Epitaxial MgO layer for low-resistance and coupling-free magnetic tunnel junctions", Applied Physics Letters, Vol. 81, No. 6, August 5, 2002, pp. 1035-1037.	
		M. Tsunoda et al., "60% magnetoresistance at room temperature in Co-Fe/Al-O/Co-Fe tunnel junctions oxidized with Kr-O <sub>2</sub> plasma", Appl. Phys. Letters, Vol. 80, No. 17, April 29, 2002, pp. 3135-3137.	
		X.-G. Zhang et al., "Effects of the iron-oxide layer in Fe-FeO-MgO-Fe tunneling junctions", Physical Review B, Vol. 68, 2003, pp. 092402-1 through 092402-4.	
		S. Mitani et al., "Fe/MgO/FeCo(100) epitaxial magnetic tunneljunctions prepared by using in situ plasma oxidation", Journal of Applied Physics, Vol. 93, No. 10, May 15, 2003, pp. 8041-8043.	
		J. Faure-Vincent et al., "High tunnel magnetoresistance in epitaxial Fe/MgO/Fe tunnel junctions", Applied Physics Letters, Vol. 82, No. 25, June 23, 2003, pp. 4507-4509.	
		M. Zwierzycki et al., "Spin injection through an Fe/InAs interface", Physical Review B, Vol. 67, 2003, pp. 092401-1 through 092401-4.	
		D. Smith et al., "Structural characterization of thin film ferromagnetic tunnel junctions", Journal of Applied Physics, Vol. 83, No. 10, May 15, 1998, pp. 5154-5158.	
		J. Mathon et al., "Theory of tunneling magnetoresistance of an epitaxial Fe/MgO/Fe (001) junction", Physical Review B, Vol. 63, pp. 220403-1 through 220403-4.	
		M. Klaua et al., "Growth, structure, electronic, and magnetic properties of MgO/Fe(001) bilayers and Fe/MgO/Fe(001) trilayers", Physical Review B, Vol. 64, pp.134411-1 through 134411-8.	

Examiner  
SignatureDate  
Considered

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